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Please add the following new claims so as to read as follows:

40. (New) A flapping apparatus, comprising:

a body;

an elastically deformable wing portion associated with said body;

a driving unit for driving said wing portion relative to said body; and

a control unit controlling the manner of driving said wing portion by said driving unit, wherein

(i) said control unit pivots said driving unit about a rotational axis such that during said pivoting of said drive unit a leading edge of said wing portion reciprocates in a forward and backward direction, and an angle of attack of said wing portion is reversed so as to generate rotational lift and wake capture,

(ii) said leading edge has a greater rigidity than the remainder of said wing portion,

(iii) said remainder of said wing portion can elastically deform when driven by said driving unit so as to generate a lift force to a degree that said flapping apparatus can hover, and

(iv) said angle of attack of said wing portion is smaller by virtue of said elastic deformation than an angle of attack of a similarly controlled rigid wing portion.

41. (New) The flapping apparatus according to claim 40, wherein

said wing portion extends outwardly from said body in a wing span direction, and said leading edge includes a wave plate structure having ridge lines or valley lines extending along said wing span direction of said wing portion.

42. (New) The flapping apparatus according to claim 40, wherein
said wing portion has an upper side and a lower side, said upper side having a greater torsional rigidity or flexural rigidity than a torsional rigidity or flexural rigidity of said lower side.

43. (New) The flapping apparatus according to claim 40, wherein
said wing portion has a leading edge and a trailing edge, said leading edge having a greater torsional rigidity or flexural rigidity than a torsional rigidity or flexural rigidity of said trailing edge.

44. (New) The flapping apparatus according to claim 40, wherein
said wing portion has an upper surface and extends outwardly from said body in a wing span direction, said upper surface of said wing portion defining a wave plate structure comprising alternating ridge lines and valley lines extending along said wing span direction of said wing portion.

45. (New) The flapping apparatus according to claim 40, wherein
said leading edge extends outwardly from said body in a wing span direction, said leading edge portion defining a wave plate structure comprising alternating ridge lines and valley lines extending along said wing span direction of said wing portion.

46. (New) The flapping apparatus according to claim 40, wherein

said wing portion includes an upper side portion comprising a self-supporting member or a non-self-supporting member and an associated support structure, and a lower side portion comprising a self-supporting member or a non-self-supporting member and an associated support structure, and a thickness of said upper side portion of said wing portion is larger than a thickness of sad lower side portion of said wing portion.

47. (New) The flapping apparatus according to claim 40, wherein

said wing portion includes a front side portion comprising a self-supporting portion or a non-self-supporting portion and an associated support structure and a trailing side portion comprising a self-supporting portion or a non-self-supporting portion and an associated support structure, and a thickness of said front side portion of said wing portion is larger than a thickness of said trailing side portion of said wing portion.

48. (New) The flapping apparatus according to claim 40, wherein

said wing portion defines a first section adjacent to which a relative velocity of a surrounding fluid is high and a second section adjacent to which a relative velocity of said surrounding fluid is low, and an angle of attack of said first section of said wing portion to said surrounding fluid is smaller than an angle of attack to said surrounding fluid of said second section of said wing portion.

49. (New) The flapping apparatus according to claim 40, wherein

said wing portion defines a tip end furthest from said body and a root substantially abutting said body, and an angle of attack to a surrounding fluid at said tip end is smaller than an angle of attack to said surrounding fluid at said root.

50. (New) The flapping apparatus according to claim 40, wherein

said wing portion is rotatable about a prescribed center of rotation, and a flexural rigidity of a first section of said wing portion is greater than a flexural rigidity of a second section of said wing portion disposed further away from said prescribed center of rotation than said first section of said wing portion.

51. (New) The flapping apparatus according to claim 40, wherein

said wing portion is rotatable about a prescribed center of rotation, said wing portion comprises a self-supporting member or a non-self-supporting member and a support structure, and a thickness of said wing portion at a first section thereof is greater than a thickness of a second section of said wing portion disposed further from said prescribed center of rotation than said first section of said wing portion.

52. (New) The flapping apparatus according to claim 40, wherein

said wing portion is rotatable about a prescribed center of rotation and defines a first section and a second section, said second section being located further from said center of rotation than said first section, and a torsional rigidity of said first section is greater than a torsional rigidity of said second section.

53. (New) The flapping apparatus according to claim 40, wherein

said wing portion defines a trailing edge, a span direction extending outwardly from said body and an axis of rotation located along said span direction of the wing portion such that said axis of rotation is positioned approximately midway between said leading edge and said trailing edge of said wing portion.

54. (New) The flapping apparatus according to claim 40, wherein

said wing portion has a lower surface, said control unit controls said driving unit such that said wing portion pivots upwardly and downwardly relative to said body in upward and downward strokes and during transitions between said upward and downward strokes said lower surface of said wing comes into contact with an upper portion of a vortex generated by the motion of said wing portion immediately before said transitions.

55. (New) The flapping apparatus according to claim 40, wherein

said wing portion defines a curved upper surface having a first center of curvature and a curved lower surface having a second center of curvature, and said control unit controls said driving unit such that said wing portion moves upwardly and downwardly relative to said body in upward and downward strokes such that elastic deformation of said wing portion occurs in a manner such that a direction of extension of an axis of rotation of a vortex generated during transitions between upward and downward strokes of said wing portion substantially matches a direction of extension of an axis connecting said centers of curvature of said upper and lower surfaces of said wing portion.

56. (New) The flapping apparatus according to claim 40, wherein

said wing portion defines a root portion substantially adjacent to said body, and when said wing portion is driven by said driving unit, said root portion moves upwardly and downwardly relative to said body periodically, and said wing portion elastically deforms such that said wing portion defines sections that move upwardly and downwardly relative to said body out of phase with the movement of said root portion.

57. (New) The flapping apparatus according to claim 56, wherein

said wing portion defines an outer tip and said wing portion elastically deforms such that a phase of motion of sections located closer to said outer tip than said body where a relatively large fluid force is exerted is delayed relative to a phase of motion of sections of said wing portion closer to said body where a relatively small fluid force is exerted.

58. (New) The flapping apparatus according to claim 57, wherein

said delay in phase is at most 1/2 of one period of said upward and downward motion of said section of said wing portion closer to said outer tip.

59. (New) The flapping apparatus according to claim 56, wherein

said wing portion elastically deforms such that a phase of the upward and downward motion of a tip end portion is delayed relative to a phase of the upward and downward motion of a root portion of said wing portion..

60. (New) The flapping apparatus according to claim 59, wherein
said delay in phase is at most 1/2 of one period of said upward and downward motion of said root of said wing portion.

61. (New) The flapping apparatus according to claim 40, wherein
a manner of control of said control unit controlling said driving unit and a manner of elastic deformation of said wing portion are related such that a prescribed parameter of movement of said wing portion is determined in accordance with a result of fluid-structure interactive analysis.

62. (New) The flapping apparatus according to claim 61, wherein
the prescribed parameter related to movement of said wing portion is a lift force generated by the upward and downward motion of said wing portion relative to said body.

63. (New) The flapping apparatus according to claim 61, wherein
the prescribed parameter related to movement of said wing portion is a value obtained by dividing a lift force generated by the motion of said wing portion by a torque necessary for driving said wing portion so as to generate a desired lift force.

64. (New) The flapping apparatus according to claim 61, wherein
the prescribed parameter related to movement of said wing portion is the highest frequency of said driving unit necessary for realizing said optimum upward and downward motion of said wing portion.

65. (New) The flapping apparatus according to claim 61, wherein
the prescribed parameter related to the movement of said wing portion is a value obtained by dividing the lift force generated by the upward and downward motion of said wing portion by an energy necessary for generating the desired lift force.

66. (New) The flapping apparatus according to claim 40, wherein
said wing portion satisfies the following relation, where f denotes flapping frequency, L denotes representative length, r denotes a distance from a portion having the highest stiffness, w denotes a load on a portion at a distance r from the portion having the highest stiffness, and d denotes a displacement generated at the portion that bears the load w exerted by the load w:

$$0.36 \times 10^{-8} < r^3 \times w/d/(L \times f)^2 < 4.48 \times 10^{-8}.$$

67. (New) The flapping apparatus according to claim 40, wherein
said wing portion has Young's modulus of 1.77×10^8 to 5.66×10^9.

68. (New) The flapping apparatus according to claim 40, wherein
said wing portion has Young's modulus of 2.5×10^8 to 2.0×10^9.

69. (New) The flapping apparatus according to claim 40, wherein
said wing portion has Young's modulus of 1.77×10^8 to 2.0×10^9.

70. (New) The flapping apparatus according to claim 40, wherein

said wing portion has an outer tip end portion and a root portion substantially adjacent to said body portion, and stiffness of a prescribed portion of said wing portion gradually increases from said outer tip end portion of said wing portion to said root portion of said wing portion, in proportion to a square of a distance from the tip end portion of said wing portion to said prescribed portion.